
एपोकसी आधारित जस्ता फास्फेट प्राईमार
(दो पैक) — विशिष्टि
(पहला पुनरीक्षण)

Epoxy Based Zinc Phosphate Primer
(Two Pack) — Specification
(First Revision)

ICS 87.040

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FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Paints, Varnishes and Related Products Sectional Committee had been approved by the Chemical Division Council.

This standard was first published in 1991. The paint obtained by the in two packs is used as a highly protective anticorrosive primer on steel surfaces for providing a much higher degree of protection than conventional single pack primer.

This revision has been taken up with a view to incorporate the maximum permissible limit of lead as lead restriction (*see 4.2*). The Committee responsible for formulation of this standard observed that in general some paints like this paint are used for household/decorative as well as for industrial applications. Taking cognizance of the fact that lead exposure of human being, particularly children, has adverse effect on human health and also adverse impact on environment and safety, the Committee felt the need to introduce different levels of lead restriction in all paint standards likely to be used for household and decorative applications. It was also decided to introduce lead restriction in some of the industrial paints, as far as possible, keeping in view, the relevance of lead restriction with respect to application condition and service life of the paint and wherever the product corresponding to a particular specification is of such composition that it would be easy to incorporate lead restriction without creating any negative impact.

Though this product is intended to be used for railway coaches, diesel and electric locomotive, it is found to be extensively used also in heavy automobiles like bus body etc. due to its good adhesion and corrosion resistance properties. For synthetic polymer based products naturally occurred extenders/fillers are not used as a part of the constituents. So it is technologically feasible to formulate this product with very low maximum permissible limit of lead. Therefore, in this revision, lead restriction up to a maximum permissible limit of 90 ppm, has been prescribed to avoid hazardous impact of lead exposure and consequent adverse impact on environment and human health. This limit also has been prescribed keeping in view of the scope for exposure to children to the paint once dried. Further, majority of consumers are not aware of the consequences of lead toxicity and its long term implications to human health. Therefore, In this revision, along with lead restriction, a suitable cautionary notice has been included in the marking clause. Reference has been given to various IS 101 (All parts) for the requirements given in the standard.

The composition of the committee responsible for the formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

EPOXY BASED ZINC PHOSPHATE PRIMER (TWO PACK) — SPECIFICATION

(*First Revision*)

1 SCOPE

1.1 This standard prescribes requirements and methods of sampling and test for two pack epoxy based zinc phosphate primer, intended to be used for the protection of exterior of railway coaches, wagons and bridges.

1.1.1 The material is intended to be used as an anti-corrosive primer in epoxy/polyurethane paint System over adequately prepared exterior steel surfaces of railway coaches, etc.

2 REFERENCES

The Indian Standards given below contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

<i>IS No.</i>	<i>Title</i>
101	Methods of sampling and test for paints, varnish and related products:
(Part 1)	Test on liquid paints (general and physical)
Sec 1 : 1986	Sampling (<i>third revision</i>)
Sec 2 : 1987	Preliminary examination and preparation of samples for testing (<i>third revision</i>)
Sec 5 : 1989	Consistency
Sec 3 : 1986	Preparation of panels (<i>third revision</i>)
Sec 6 : 1987	Flash point (<i>third revision</i>)
Sec 7 : 1987	Mass per 10 litre (<i>third revision</i>)
(Part 3)	Tests on paint film formation
Sec 1 : 1986	Drying time (<i>third revision</i>)
Sec 2 : 1989	Film thickness (<i>third revision</i>)
Sec 4 : 1987	Finish (<i>third revision</i>)

<i>IS No.</i>	<i>Title</i>
(Part 4)	Optical tests on paint films
Sec 2 : 1989	Colour (<i>third revision</i>)
(Part 5)	Mechanical tests on paint films
Sec 2 : 1988	Flexibility and adhesion (<i>third revision</i>)
(Part 6)	Durability tests on paint films
Sec 1 : 1988	Resistance to humidity under conditions of condensation (<i>third revision</i>)
Sec 2 : 1989	Keeping properties (<i>third revision</i>)
(Part 8)	Tests for pigments and other solids
Sec 2 : 1990	Pigments and non-volatile matter (<i>third revision</i>)
Sec 5 : 1993	Lead restriction test (<i>third revision</i>)
Sec 6 : 1993	Volume solids (<i>third revision</i>)
170 : 1986	Acetone (<i>third revision</i>)
1070 : 1992	Reagent grade water (<i>third revision</i>)
1303 : 1983	Glossary of terms relating to paints (<i>second revision</i>)
1407 : 1980	Round paint tins (<i>second revision</i>)
2552 : 1989	Steel drums (galvanized and ungalvanized) (<i>third revision</i>)
9162 : 1979	Methods of tests for epoxy resins, hardners and epoxy resin composition for floor topping
9850 : 1981	Methyl <i>iso</i> butylketone
10897 : 1984	Specification for Zinc Phosphate Pigment for Paints

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 1303 and the following shall apply.

3.1 Component — Each of the two parts of the paint which when mixed together, forms an epoxy based zinc phosphate priming paint.

3.2 Paint — The mixture of the two components in the proportion recommended by the manufacturer.

4 REQUIREMENTS

4.1 Composition

The paint shall consist essentially of two components, base and hardener to be mixed in such simple proportion preferably by volume to satisfy all the requirements of this standard.

4.1.1 Bases shall consist of:

- a) epoxy resin, and
- b) a pigment.

4.1.1.1 Epoxy resin, used in the formulation of the paint, shall have the weight per epoxy equivalent of 400-600 on non-volatile vehicle content, when tested according to 4 of IS 9162.

4.1.1.2 The base shall contain a minimum of 40 percent by mass of pigment on the mass of paint. The pigment shall contain a minimum of 16 percent by mass of zinc phosphate (*see* IS 10897) in the total pigment content apart from other pigments such as extenders, rust inhibitors, etc, when tested according to IS 101 (Part 8/Sec 2) using the following extraction mixture:

- a) Methyl iso-butyl ketone 25 parts
(*see* IS 9850), or methyl methyl ketone, < or
a mixture of both in the ratio 1 : 1,
by volume;
- b) Xylene 50 parts
- c) Acetone (*see* IS 170) 25 parts

4.1.2 Hardener shall be liquid type, such as an aliphatic amine, an aliphatic or aromatic amine adduct, a polyimide or amidopolyamine. It shall react with epoxy resin at normal ambient temperature.

4.1.3 The mixture of base and hardener shall be allowed to mature for 20 min at 27 ± 2 °C. The mixture must be consumed within 4 h after mixing.

4.2 Lead Restriction

The material shall not contain lead or compounds of lead or mixtures of both, as metallic lead more than 90 ppm, when tested for restriction from lead in accordance with IS 101 (Part 8/Sec 5).

4.3 The material shall also comply with the requirements given in Table 1.

5 PACKING AND MARKING

5.1 Packing

Unless otherwise agreed to between the purchaser and the supplier, the material shall be packed in metal containers conforming to IS 1407 and IS 2552. The packing is subject to the provisions of the law in force in the country at that time.

5.1.1 Each component as delivered shall be free of gel, coarse particles, skins, foreign matter and sediments. Any sediment formed in the container shall be mixed thoroughly preferably with power driven stirrer to form homogeneous paint.

5.2 Marking

5.2.1 Each container shall be marked with the following:

- a) Name of the material;
- b) Indication of the source of manufacture;
- c) Lead content (Maximum);
- d) Volume of the material;
- e) Batch number or lot number in code or otherwise;
- f) Month and year of manufacture; and
- g) Mixing proportion recommended for use;
- h) Other instructions for safe handling and use of the material;
- j) Safe storage period; and
- k) A cautionary note as below:
 - 1) Keep out of reach of children.
 - 2) Dried film of this paint may be harmful, if eaten or chewed.
 - 3) This product may be harmful, if swallowed or inhaled.

5.2.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

6 SAMPLING

6.1 Representative samples of the material shall be drawn as per to 6 of IS 101 (Part 1/Sec 1).

6.2 Preparation of Test Samples

6.2.1 Apparatus

Table 1 Requirements for Epoxy Based Zinc Phosphate Primer (Two Pack)

(Clause 4.3 and 7.1)

Sl No.	Characteristic	Requirement	Method of Test Ref to	
			IS 101	Annex
(1)	(2)	(3)	(4)	(5)
i)	Consistency	Smooth, uniform and suitable for spray application	—	A
ii)	Drying time, <i>Max</i> , h:		(Part 3/Sec 1)	—
	a) Surface dry	4		
	b) Hard dry	16		
	c) Hard dry, 70 °C	30 min, with 15 min flash off time		
	d) Curing time, <i>Max</i>	7 days		
iii)	Finish	Smooth, matt and egg shell flat	(Part 3/Sec 4)	—
iv)	Colour	Off white/grey	(Part 4/Sec 2)	—
v)	Dry film thickness per coat:		Clause 6.2.2.1 of (Part 3/Sec 2)	—
	a) By brushing, <i>Min</i>	30 microns		
	b) By spray	35-40 microns		
vi)	Volume solids, percent, <i>Min</i>	40	(Part 8/Sec 6)	—
vii)	Flexibility and adhesion:			
	a) Bend test (with 6.25 mm dia mandrel and type 1 apparatus)	No visible damage or detachment after	Clause 2 of (Part 5/Sec 2)	—
	b) Scratch hardness (1 500 g)	No such scratch as to show the bare metal	Clause 3 of (Part 5/Sec 2)	—
viii)	Flash point (for each component)	Not below 25 °C	(Part 1/Sec 6)	—
ix)	Resistance to humidity under condition of condensation and salt spray (expose for 500 h):		(Part 6/Sec 1)	—
	a) Resistance to humidity	To pass the test	Clause 2	
	b) Resistance to salt spray	To pass the test	Clause 3	
x)	Pot life, h, 27 ± 2 °C, <i>Min</i>	4	—	B
xi)	Mass, in kg/10 litre, <i>Min</i>	13.0	(Part 1/Sec 7)	—
xii)	Keeping properties	Not less than one year from date of manufacturing	(Part 6/Sec 2)	—

6.2.2.1 Suitable high speed stirrer**6.2.2.2 Spray gun**

A spray gun with adjustable nozzle aperture and air pressure suitable for spraying paints. The spray gun shall be thoroughly cleaned before use. Correct size of nozzle and air-cap shall be fitted to it. The air pressure shall be adjusted in accordance with the viscosity of the material to be sprayed.

6.2.2 Preparation of Paints

The two component epoxy zinc phosphate primer shall be mixed in the ratio recommended by the manufacturer of the paint before conducting the test or tests. During mixing of two components in large quantities, the mixing may be done using a high speed stirrer and the rise in temperature shall not be more than 5 °C.

6.2.3 Preparation of Panels for Drying Time and Dry Film Thickness

Prepare mild steel panel of sizes 150 mm × 100 mm × 1.25 mm as prescribed in 2 of IS 101 (Part 1/Sec 3). Apply the paint as prepared in 6.2.2 uniformly on each side of the panel by air spraying/by brushing to give a dry film mass commensurate with the mass per 10 litre as specified in Table 1 of IS 101 (Part 3/Sec 4). Prepared test panel then subjected to the test as specified in IS 101 (Part 3/Sec 1) as soon as possible.

6.2.4 For Flexibility and Adhesion Test

For both bend test and scratch hardness test prepare separate burnished tin plate panels, rectangular, of sizes 100 mm × 50 mm × 0.3 mm as prescribed in 3 of IS 101 (Part 1/Sec 3). Apply paint as prepared in 6.2.2

uniformly by air spraying/by brushing on the panels as to give a dry film mass commensurate with the mass per 10 litre as specified in Table 1 of IS 101 (Part 3/Sec 4). Allow some time for the coat to dry and measure the paint thickness by the method prescribed in **6.2.2.1** of IS 101 (Part 3/Sec 2). Ensure that the coating is even and uniform and thickness of coating of the paint shall be between 35 and 45 microns. The coated test panels shall be dried for 72 h and then shall be conditioned at a temperature of 27 ± 2 °C and relative humidity of 65 ± 5 percent for a period of 16 h. Prepared test panels then subjected to the test as prescribed in **2** and **3** of IS 101 (Part 5/Sec 2) for bend test and scratch hardness test respectively.

6.2.5 *Resistance to Humidity under Condition of Condensation*

Prepare mild steel panel of sizes 125 mm × 50 mm × 1.25 mm as prescribed in **3** and **2** of IS 101 (Part 1/Sec 3). Apply single coat of the paint on both sides of the panel uniformly by air spraying/brushing to give a dry film thickness on each side 40 ± 5 microns. Allow to dry for 24 h at room temperature. Determine the thickness in micrometre, of the dry coating, by any appropriate method but using any one of the non-destructive procedures as specified in IS 101 (Part 3/Sec 2). Then protect the edges to a depth of 5 mm with a suitable protective composition [preferably consisting of 3 parts by weight of paraffin wax (melting point 60 °C) and 1 part by weight of carnauba wax]

which shall have melting point above 50 °C. Prepared test panel then subjected to the tests as prescribed in **2** and **3** of IS 101 (Part 6/Sec 1).

6.3 Criteria for Conformity

6.3.1 Drying time and film thickness shall be tested on at least two samples taken from different containers selected according to **7.1**. For lot size above 1 000 kg, this shall be minimum 3. For the rest of the characteristics, tests shall be conducted on one composite sample prepared from individual samples taken from different containers in the sample.

6.3.2 There shall be no failure in respect of any test, if the lot is to be considered conforming to the requirements of this specification.

7 TEST METHODS

7.1 Tests shall be conducted as prescribed in **4.1** to **4.2** and the test methods referred in col 4 and 5 of Table 1.

7.2 Unless otherwise specified the preparation of metal panels shall be according to IS 101 (Part 1/Sec 3).

7.3 Quality of Reagents

Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070) shall be employed.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

ANNEX A

[Table 1, *Sl No.* (i)]

CONSISTENCY

A-1 APPARATUS

A-1.1 Palette Knife or Metal Rod

A-1.2 Metal Panels

Unless specified otherwise, steel panels of size 150 mm × 150 mm × 1.25 mm shall be prepared as prescribed in 2 of IS 101 (Part 1/Sec 3).

A-2 PROCEDURE

A-2.1 Insert a clean metal rod or palette knife into the original container of each component and examine

the nature of settling. Mix the two components in the proportion recommended by the manufacturer in a separate container.

A-2.2 Observations

The material shall not cake hard inside the container and shall be in such a condition that stirring easily produces a smooth uniform paint suitable for spraying. After mixing of the two components as in **A-2.1**, it shall produce a smooth uniform paint suitable for spraying/brushing on steel panels.

ANNEX B

[Table 1, *Sl No.* (xi)]

DETERMINATION OF POT LIFE

B-1 GENERAL

The time taken to reach to end of working life from the original viscosity shall be considered as the pot life of the material.

B-2 PROCEDURE

B-2.1 Condition the components of the coating for one h at 27 °C and mix immediately in the proper ratio to fill the can to be approximately 1 cm of the top. The lid should be loosely placed on the can.

B-2.2 Measure the viscosity initially and every hour thereafter, as prescribed in IS 101 (Part 1/Sec 5).

NOTE — The interval may be shortened, if desired.

B-2.3 Near the end of the coating's working life, the viscosity builds up rapidly. When it appears that the coating may be too viscous to spray, remove a small portion and add the appropriate thinner. If the paint can still be thinned, the end of the working life has not been reached.

B-2.4 The end of the working life is reached when the paint gels, becomes stringy or cannot be thinned for application.

B-3 REPORTING

Report the working life as pot life of the period.

ANNEX C

(Foreword)

COMMITTEE COMPOSITION

Paints, Varnishes and Related Products Sectional Committee, CHD 20

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This Indian Standard has been developed from Doc No.: CHD 20 (16070).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Published by BIS, New Delhi